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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/709,616	11/13/2000	David W. Warren	12.150	4083

7590 10/06/2003

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EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/709,616	Applicant(s) WARREN ET AL.	
	Examiner Jennifer A. Leung	Art Unit 1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. Applicant's amendments submitted on June 30, 2003 and July 11, 2003 have been received and carefully considered. The changes made to the Specification are acceptable. It is unclear as to whether applicant wishes to cancel claims 13 and 14, since the amendment submitted on June 30, 2003 only provides a listing and comments for claims 1-12 and 15. Claim 15 has been added. Claims 1-15 remain active.

Claim Objections

2. Claims 3, 7, 10, 11 and 15 are objected to because of the following informalities:

- In claim 3, -- a -- should be inserted before "space" (line 3).
- In claim 7, -- an -- should be inserted before "annular space" (line 3).
- In claim 10, -- a -- should be inserted before "helical length" (line 2), and -- an -- should be inserted before "hourly" (line 3).
- In claim 11, "stem" in line 2 should be changed to -- steam --.
- In claim 15, "and" should be deleted in line 3 and added to the end of line 6.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claim 1, "said exothermic reactor heat" (line 22) lacks proper

antecedent basis. Regarding claims 13 and 14, it is unclear as to the additional structural limitations applicants are attempting to recite, since the recited structural limitations have substantially been incorporated into independent claim 1.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5, 7, 8, 10 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Sederquist et al. (WO 97/44123).

Regarding claims 1 and 13-15, Sederquist et al. (FIG. 1; page 5, "Best Mode..." to page 6, second paragraph) disclose a thermally-integrated water-gas shift comprising, in combination,

a) a waste-heat recovery steam generator for the recovery of exothermic reaction heat (i.e., heat exchange device **38**, for passing a pressurized water coolant;

b) an outer region (cylindrical catalyst chamber **12**) extending at least part way about (i.e., surrounding) said waste-heat recovery steam generator **38**;

c) a catalyst bed **30** located within said outer region **12**, and through which reformate gases flow (i.e. entering via upstream plenum **53** to exiting via downstream plenum **54**); and

d) the outer region **12** being in heat transfer communication with the steam generator **38** to maintain the catalyst bed **30** within a predetermined temperature range.

In view of the newly added limitations, Sederquist et al. further disclose catalyst bed **30** "extends helically", there being flow guide surfaces (as defined by plate coil **52** of generator **38**, which surrounds cooling coils **41/42**) extending helically and adjacent the catalyst bed, to direct

cooling fluid around the periphery of the actively cooled catalytic bed zone **34** and to *inherently* direct gases to flow helically through the bed, as evidenced by the catalyst particles **30** of zone **34** being helically embedded in the spaces between helical flow guide surfaces **52** (see FIG. 1).

Regarding claim 2, no further structural limitations are recited, since the operating temperature is not considered an element of the apparatus. In any event, Sederquist disclose operation of the steam generator within the recited ranges (page 7, second and third paragraphs).

Regarding claim 3, Sederquist et al. disclose catalyst bed **30** comprising a Cu/Zn catalyst (page 5, last paragraph), having an inner wall (i.e. as defined by the tube wall of cooling coils **40**; FIG. 1) in thermal contact with boiling water fluid in generator **38** (page 4, last paragraph).

Regarding claims 4-5, Sederquist et al. disclose the boiling water fluid (flowing within generator **38**) is located proximate bed **30**, wherein bed **30** extends helically about said waste heat recovery steam generator **38** (as commented above) to transfer heat to the boiling water fluid to generate steam (page 4, last paragraph; page 7, second and third paragraph).

Regarding claim 8, Sederquist et al. disclose catalyst bed **30** is "sufficiently close" to said generator **38**, as evidenced by the bed being maintained within the recited temperature ranges (page 7, second and third paragraphs).

Instant claims 1-5, 8 and 13-15 structurally read on the apparatus of Sederquist et al.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,458,857) in view of Kydd (U.S. 3,607,125).

Regarding claims 1, 6, 7 and 13-15, Collins et al. (FIG. 3, 4, 6, 7; column 8, line 19 to column 12, line 52; more specifically, column 8, lines 35-53; column 9, lines 35-54) disclose a thermally-integrated water-gas shift reactor comprising, in combination,

a) a waste-heat recovery steam generator **416** for the recovery of exothermic reaction heat to generate steam; and

b) an outer region (i.e. comprising low temperature shift reactors **414**) extending about said waste-heat steam generator **416**, defined by an annular space having an inner wall and outer wall (between reforming chamber **422** and vessel **418**);

c) a catalyst bed (i.e. a suitable low temperature shift reaction catalyst **438**) located within said outer region, and through which reformate gases flow (i.e. reformate flow from upper chamber **462** to lower chamber **464**); and

d) the outer region **414** being in heat transfer communication with the steam generator **416** to maintain the catalyst bed **438** within a predetermined temperature range for operation of a low temperature shift reaction.

In view of the newly added limitations, Collins disclose, "it is also possible to use other suitable heat exchanger arrangements to transfer heat between the low temperature shift reactors and the steam generator," (column 12, lines 31-39) and suggests "plate fin heat exchanger etc." However, Collins is silent as to said bed comprising "flow guide surfaces" which extend helically and adjacent the catalyst **438**, such that said bed "extends helically" and such that said gases flow helically through the bed. In any event, it would have been an obvious design choice

for one of ordinary skill in the art at the time the invention was made to provide the recited "flow guide surfaces" to the apparatus of Collins et al., on the basis of suitability for the intended use, since the use of a "continuous helical fin projection or other well-known extended heat transfer surfaces" for improving heat exchange is well known in the art, as evidenced by Kydd (column 3, lines 19-35). As taught by Kydd, heat exchange is rapidly accomplished since a generally high gas pressure exists on either side of the heat transfer surface, and the inner and outer surface area of the heat transfer surface is increased by the helical fin projection. Additionally, it has been held that substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

Regarding claim 2, no further structural limitations are recited, as the operating temperature of generator **416** is not considered an element of the apparatus. In any event, Collins et al. disclose, "The temperature of the steam generator **416** and therefore the temperature of the low temperature shift reaction catalyst **438** is controlled by regulating the temperature of the steam generator **416**," and catalyst **438** is ideally operated at a temperature between 140 °C and 220 °C (equivalent to 284 °F and 428 °F) and possibly a broader range of 110 °C to 250 °C (equivalent to 230 °F to 482 °F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claims 3-5, Collins et al. (FIG. 3, 4, 6, 7) disclose a suitable low temperature shift catalyst **438** may comprise a Cu/Zn catalyst; the apparatus having an inner wall that is in thermal contact with said generator **416**, such that the boiling water fluid (in water space **432**, steam space **434**) is located proximate the catalyst bed to heat the bed during start-up. As modified by Kydd above, the apparatus of Collins comprises a bed **438** that extends helically about generator **416**. (column 8, lines 45-51; column 10, line 68 to column 11, line 46).

With respect to claim 8, Collins et al. disclose catalyst bed **438** is "sufficiently close" to said generator, as evidenced by the catalyst **438** being ideally operated at a temperature between 140 °C and 220 °C (equivalent to 284 °F and 428 °F) and possibly a broader range of 110 °C to 250 °C (equivalent to 230 °F to 482 °F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claim 9, although Collins et al. are silent as to the annular space being 1 to 2 inches wide, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to select an appropriate width for the annular space in the apparatus of Collins et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, since it has been held that changes in size involve only ordinary skill in the art. *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955), and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233*.

Regarding claim 10, although the collective teachings of Collins and Kydd are silent as to the helical length of the catalyst bed, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate length of the bed in the modified apparatus of Collins et al., on the basis of suitability for the intended use (i.e., for achieving the recited range of gas hourly space velocity), since it has been held that changes in size involve only ordinary skill in the art. *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955), and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233*.

Regarding claim 11, Collins (FIG. 3, 4, 6, 7; column 8, lines 54-68; column 11, lines 29-46) disclose generator **416** comprises heat transfer conduits (start-up tubes **417**) that transfer heat from combustion products to boiling water fluid (i.e., in water space **432**, steam space **434**).

Regarding claim 12, Collins et al. (FIG. 3, 4, 6, 7; column 8, lines 36-68; column 9, lines 21-35) disclose generator **416** includes an upright vessel, said outer region **414** having an upper level inlet (via upper chamber **422**) and a lower level outlet (via lower chamber **464**), heat transfer conduit(s) (start-up tubes **417**) extending within said vessel and immersed within boiling water (located within water space **432**, steam space **434**) inwardly of said bed **438**, said conduit or conduits **417** receiving hot products of combustion from a combustion process (i.e. via combustion catalyst **429**), operable for transfer of heat to the boiling water, for generating steam.

6. Claims 1, 2, 7, 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buswell et al. (U.S. 5,464,606).

Regarding claims 1 and 13, Buswell et al. (FIG. 3, 4; column 4, line 12 to column 5, line 12) disclose a water-gas shift reactor comprising, in combination,

a) a waste-heat recovery heat exchanger (i.e., within cooled section **304/404**, comprising coolant coil **306/406**) for the recovery of exothermic reaction heat;

b) an outer region (i.e., the space defined by the inner surface of reactor **301/401** and the outer surface of heat exchanger coil **306/406**) extending at least part way about (i.e., surrounding) the heat exchanger **306/406;**

c) a catalyst bed located within said outer region (i.e. annular catalyst bed **302/402**), through which reformate gases flow; and

d) the outer region being in heat transfer communication with the heat exchanger **306/406** to maintain the catalyst bed **302/402** within a predetermined temperature range.

In view of the newly added limitations, Buswell disclose annular catalyst bed **302/402** "extends helically" (see FIG.), there being flow guide surfaces (i.e., outer surface of coil **306/406**) extending helically adjacent the catalyst bed. The surfaces of coil **306/406** *inherently*

direct gases, introduced via inlet **305/405**, to flow helically through the bed, as evidenced by the catalyst being helically embedded in the space defined by the outer surface of coil **305/406** and the inner surface of reactor **301/401**. Although Buswell is silent as to whether the heat exchange medium for exchanger **306/406** comprises water for steam generation, the apparatus of Buswell meets the claims, as the apparatus substantially comprises the recited structural elements and is capable of generating steam. Also, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to select water as the exchange medium in the apparatus of Buswell et al., on the basis of suitability for the intended use, since the use as water/steam as a heat exchange medium is well known in the art.

Regarding claim 2, no further structural limitations are recited since the operating temperature range of heat exchanger **306/406** is not considered a structural element of the apparatus, and therefore the apparatus of Buswell et al. meets the claim.

Regarding claim 7, Buswell et al. (FIG. 3, 4; column 4, line 12 to column 5, line 12) disclose a helical coil **306/406** adjacent the inner and outer walls (which define the annular catalyst region **302/402**) to conduct and *inherently* increase the velocity of the process gases as they flow through the catalyst bed **302/402**, and to enhance the rate of heat transfer to and from the catalyst bed, given the increased contact and surface area provided by the helical coil.

Regarding claim 8, Buswell disclose the catalyst bed **302/402** is "sufficiently close" to the generator **306/406**, as evidenced by a catalyst bed operating temperature within the recited temperature ranges (see column 4, lines 13-27; 47-56).

Response to Arguments

7. The rejections made with respect to Buswell et al. in item 9 of the prior Office Action have been restated herein, since applicant has failed to provide a response to said rejections.

8. Applicant's arguments regarding the rejections made with respect to Collins et al. have been fully considered but are moot in view of the new grounds of rejection as necessitated by amendment, which recites a newly added feature of "flow guide surfaces".

9. Applicant's arguments regarding the rejections made with respect to Sederquist et al. have been fully considered but are not persuasive. As commented above and in the prior Office Action, Sederquist et al. disclose a helical coil (i.e., comprising a plurality of cooling coils **40**, including a plate coil **52**; Fig. 1) disposed within a catalyst bed **30**. Applicant argues, "[t]his citation refers to helical coils formed from pipes containing a cooling fluid that are imbedded inside a catalyst bed. The citation does not refer to a helical catalyst structure, as claimed herein." (page 9, last paragraph to page 10, first paragraph). However, the examiner respectfully disagrees and asserts that the "helical catalyst structure" as recited by applicants is indeed present in the apparatus of Sederquist. Turning to FIG. 1 of Sederquist, it is seen that the catalyst particles **30** in the catalyst zone **34** are "helically" disposed, or namely, embedded in the spaces defined between adjacent "helical flow guide surfaces" of the plate coil **52** element of coils **40**, thereby defining the recited "helically extending" catalyst bed.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is 703-305-4951. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 703-308-6824. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung
September 24, 2003

Hien Tran

HIEN TRAN
PRIMARY EXAMINER